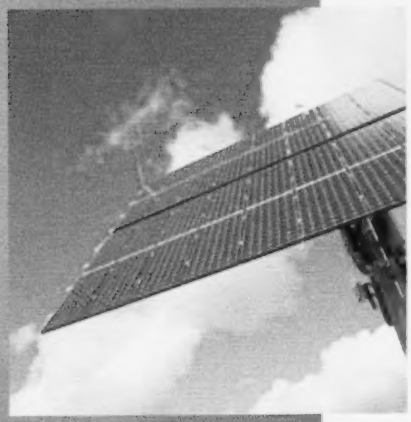
Climate Vision

Climate Change Progress Report



Ontario

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Minister's message

Message from the Minister

Ontario's fresh air, clean water and outdoor spaces make our province a great place to live, work and play.

Climate change threatens the natural environment that sustains us, our roads and buildings, the food we eat and the water we drink. When faced with this reality, we cannot afford to wait and see. Real action is needed to protect our environment, our quality of life and our economy.

As the world moves toward a focus on sustainable cities and a low-carbon approach to meet our growing energy requirements, Ontario is taking action. We are moving forward with creating a conservation culture and a sustainable, clean low-carbon economy. We are building a future where we can be confident that the decisions we make today ensure our children grow up in an environment that is productive, protected and respected by all.

Five years ago, we launched the Climate Change Action Plan, our framework for reducing greenhouse gas emissions. Just over one year ago, we introduced Climate Ready: Ontario's Adaptation Strategy and Action Plan, our plan to prepare for, and respond to, the impacts of climate change.

Since we launched these initiatives, we have achieved notable milestones and been recognized for our accomplishments. We are the first in North America to close coal-fired generating stations. It has resulted in significant reductions in greenhouse gas emissions and other contaminants, benefitting our environment and the health of Ontarians. Developing compact communities with a focus on regional transit and infrastructure is key to overall lower greenhouse gas emissions and is central to managing the effects of climate change.

Today, Ontario has the second lowest per capita greenhouse gas emissions in Canada – about half the national average. Earlier this year we were named the "Greenest Province" by the Corporate Knights organization. Our Building

Code's January 2012 energy efficiency requirements were rated "Best in North America" by the Canadian Energy Efficiency Alliance. We have achieved these results through some of the most innovative climate change initiatives in North America. We have done so through collaboration and cooperation with private industry, communities and individuals and with leading expertise from Ontario's scientific and academic institutions.

Climate change presents an environmental challenge but also offers a tremendous opportunity for sustainable growth for the present and the future. We are positioning Ontario to protect the environment, attract investments and support job creation as a leader in the low-carbon economy. Our commitment to green energy such as wind and solar power is bringing more than $16 billion in investment, and supports or creates thousands of jobs. Ontario firms will continue to be world leaders in the development of clean technologies, products and services that contribute to a cleaner environment and ensure a sustainable economic future.

This report highlights the journey we are on, a journey we share with all Ontarians. Successfully managing the challenge of climate change will be our legacy to future generations. We owe it to them, and to ourselves, to build an Ontario that is stronger and more sustainable than ever, where prosperity and respect for the environment go hand-in-hand.

Jim Bradley
Minister of the Environment

INTRODUCTION

This past summer, Ontario experienced some of the hottest and longest dry spells in its history. Warmer summers and shorter winters may be enjoyable for some but they also affect our communities and businesses in negative ways. If greenhouse gas emissions continue to grow, people around the world will be increasingly vulnerable to the effects of climate change.

The impacts of climate change, here and globally, include: changes in warm weather growing seasons; lower water levels in the Great Lakes; greater stress on public infrastructure from extreme weather events; heat stress on vulnerable people; increased demand on emergency services and impacts on tourism and recreation.

Climate change is not a temporary problem. We are faced with the reality that we have to plan differently, prepare in new ways and protect what we thought was safe. We all want a sustainable environment and a safe, clean future for ourselves and our children.

The way we plan and proceed as we manage the challenges of a changing climate requires careful analysis. Through cooperation and collaboration with our partners, we are on track with a wide range of mitigation policies and adaptation strategies that have multiple benefits for Ontario.

The burning of fossil fuels for energy, heat, transportation, agricultural activity, disposing of waste in landfills and industrial activity all contribute to climate change. Many greenhouse gases will remain in the atmosphere for a few to hundreds of years. We know we can reduce harmful emissions in a way that also protects communities and allows businesses to prosper.

No single program or policy can solve climate change. Ontario is working closely with every sector contributing to and affected by climate change and engaging communities, industry and the research sector to ensure we maximize our mitigation and adaptation strategies.

Here in Ontario, we are fortunate to enjoy an environment that has always "been there" for us whenever we needed it. Fresh water, beautiful parks and forests, seemingly endless resources and clean air are something previous generations enjoyed in abundance while they built a future for themselves and their children. Now it is our turn to protect those resources as our ingenuity and ability to adapt are being tested. We either rise to meet the challenge or fail to recognise that climate change is the defining issue of our times.

Some of the ways climate change has an impact on our lives:

The Water We Drink and Use

- The Great Lakes contain approximately 20 per cent of the world's fresh water supply. Most Ontarians rely on the lakes for their drinking water. Great Lakes levels could fall by one metre by 2050[1]. The Great Lakes are also experiencing decreased ice cover[2]. Lower water levels caused by less snow in the winter and warmer summers can lead to excessive growth of nuisance and health-threatening algae. Near shore fish spawning areas and other natural shoreline assets may be temporarily disrupted.
- Hydro power generation can become less efficient if an earlier snow melt changes seasonal flow volumes.

Agriculture and the Food We Eat

- Ontario has a diverse agricultural sector that represents close to one quarter of Canada's total agricultural production. Warmer weather and longer growing seasons were once thought to be a benefit to Ontario farmers. That view is changing. Climate change threatens certain crops and the variation in temperature and precipitation from year to year presents major challenges. Hot and dry summer weather in many parts of the province has stressed field and horticulture crops.

Our Health

- Rising temperatures and reduced air quality will lead to an increase in the incidence of heat-related illness and respiratory and cardiovascular disorders while extreme cold events will increase the incidence of hypothermia and frostbite.

1 Natural Resources Canada. 2009. Our Water. http://www.nrcan.gc.ca/earth-sciences/climate-change/community-adaptation/poster/577.

2 http://journals.ametsoc.org/doi/abs/10.1175/2011JCLI4066.1

- As summer temperatures increase and the winters become shorter, the risk of diseases (e.g., Lyme Disease, West Nile Virus) transmitted by mosquitoes, ticks and other vectors will increase due to ecological changes, increased human exposure, and faster maturation cycles for pathogens.
- An extension of the warm weather season can also aggravate allergy symptoms and respiratory conditions due to increased pollen and spore production. Increased sun exposure during an extended warm weather can also lead to an increased incidence of sunstrokes, eye damage and other related conditions.
- Other potential impacts of climate change on human health include an increased risk of food and waterborne illnesses and the possibility of injury, illness or loss of life due to damage and weakening of infrastructure from extreme weather events such as flooding, ice and windstorms.

Ontario's Ecosystems

- As winters have become shorter and summer evaporation has increased, Ontario's diverse ecosystems are changing. For example, plant and animal species will adapt where they are, migrate to new habitats or disappear. Sport fisheries are already finding warm water fish where cold water fish used to be.
- Ontario's forests cover almost 65 per cent of the province's land area but trees cannot migrate as fast as most animals can and the mix of deciduous and coniferous species will change.
- The migration of southern species into habitats in northern, eastern and western parts of Ontario can pose serious immediate threats to those ecosystems, affecting communities and local economies.
- The fire season is getting longer. For example, it is now a week longer in northwestern Ontario than it was in the 1960s.

Did you know?

According to the Insurance Bureau of Canada, catastrophic events, such as flooding, cost roughly $1.6 billion in 2011 and almost $1 billion in each of the two previous years. The majority of these insured losses were caused by extreme weather events.

On June 5 and 6, 2010, the southern Ontario town of Leamington and surrounding areas were subjected to a wind and thunderstorm event that resulted in estimated insured losses of $120 million to residential and commercial properties.

[Source: PCS (Property Claim Services), November 23, 2010: Catastrophe Serial No. 23-4. Final Estimate]

Public Infrastructure and Personal Property

- The average age of infrastructure – roads, bridges, sewer systems and buildings – is 15.4 years. Historic weather patterns, such as the change in seasons, were considered when the infrastructure was designed but it is unlikely that more extreme weather conditions were factored into their design. This means that infrastructure may not last as long and could pose a threat to public safety.
- Remote communities in the far north rely on winter roads to travel and transport goods. Warmer winters and the earlier arrival of spring can significantly reduce the ice road season to as little as three weeks in some years.

It is easy to see how climate change affects our lives and how much work needs to be done on an ongoing basis. We need to ensure reductions in greenhouse gas emissions but also prepare people and industry for adapting to a changing environment.

Directly or indirectly, our economy depends on the environment and we can not afford to be left behind. We are committed to making the right decisions that meet the needs of Ontarians – including farmers, asset managers and policy developers – to ensure our future for the long term.

This is why our province continues to invest in clean technologies and is taking action to safeguard our communities against the impacts of climate change. Many of these actions will reduce greenhouse gas emissions, protect us from major losses due to extreme weather, and provide an immediate and long-term boost to Ontario's economy.

Ontarians from around the province – urban and rural, groups and individuals, schools and industry – are showing leadership by reducing their carbon footprint, contributing to innovation in the area of clean technology and encouraging others to take action.

Throughout this report you will learn more about the key actions Ontario is taking to tackle climate change. You will also read examples of leadership in action as we highlight how communities, businesses and individuals across Ontario are making a difference in the fight against climate change.

SECTION 1: LONG-TERM PLANS

Ontario set a target to reduce greenhouse gas emissions six per cent below 1990 levels by 2014. Including initiatives launched to date, we anticipate that Ontario will deliver more than 90 per cent of the reductions needed to reach our 2014 target.

For a detailed appendix of Ontario's GHG emissions data, please download the PDF from our website:

For the English report:
http://www.ene.gov.on.ca/environment/en/resources/STDPROD_100825

For the French report:
http://www.ene.gov.on.ca/environment/fr/resources/STDPROD_100827

We have accomplished a lot so far but realise the solutions we implement today need to be designed now with an eye to the future of our province. We are creating an infrastructure of policies and programs where immediate and long term reductions in greenhouse gas emissions provide a framework for prosperity in the emerging low-carbon economy.

We have already put in place many pieces of this framework and are seeing the cumulative, connected benefit of our initiatives.

LEADING IN CLEAN ENERGY AND CREATING JOBS

We are making the transition to a low-carbon economy and creating jobs by replacing energy sources that contribute to greenhouse gases – such as coal – with clean energy.

With the introduction of the Green Energy and Green Economy Act, 2009, and the Long-Term Energy Plan, we are encouraging positive change in Ontario's energy system.

PROTECTING OUR GREEN SPACE, AGRICULTURAL LAND AND ECOLOGY

Green space and protected agricultural land and forests contribute to healthy communities and environment.

We are continuing to implement strategies in our Growth Plan, Greenbelt Plan and in developing community based land use plans for the Far North to promote sustainable growth while ensuring that land is protected.

TACKLING GREENHOUSE GAS EMISSIONS IN ALL SECTORS

We have introduced measures to reduce greenhouse gas emissions in the electricity, industry, buildings, transportation, agriculture and waste sectors.

We are helping these sectors develop innovative approaches so they remain competitive and meet their environmental responsibilities.

PROMOTING ENERGY EFFICIENCY AND CONSERVATION

We are encouraging Ontarians to conserve energy and working with electricity and natural gas companies to enhance energy efficiency programs.

These programs reduce greenhouse gas emissions and help families and businesses save money.

INVESTING IN PUBLIC TRANSIT TO SUPPORT A STRONG INFRASTRUCTURE AND LIVEABLE COMMUNITIES

The Province is making unprecedented investments in public transit to support a strong infrastructure.

Making it easier for people to leave their cars at home promotes healthy communities and helps protect the environment.

We are building the foundation that will help reduce our carbon footprint with a group of distinct, long-term initiatives that support our objectives. The following initiatives will be essential in helping to achieve our goals for years to come:

Provincial Policy Statement

As part of the Provincial Policy Statement (PPS) review under the Planning Act, the Ministry of Municipal Affairs and Housing has been working with the Ministry of the Environment and other ministries to incorporate additional policy direction related to climate change.

Draft policies were posted for consultation on the Environmental Registry in September 2012 and propose revisions to promote awareness and require consideration of the potential impacts of climate change in Ontario communities.

Some of the draft policies that are posted for consultation include:

- Ensuring healthy, liveable and safe communities are sustained by promoting development and land use patterns that maintain biodiversity and resilience to climate change.

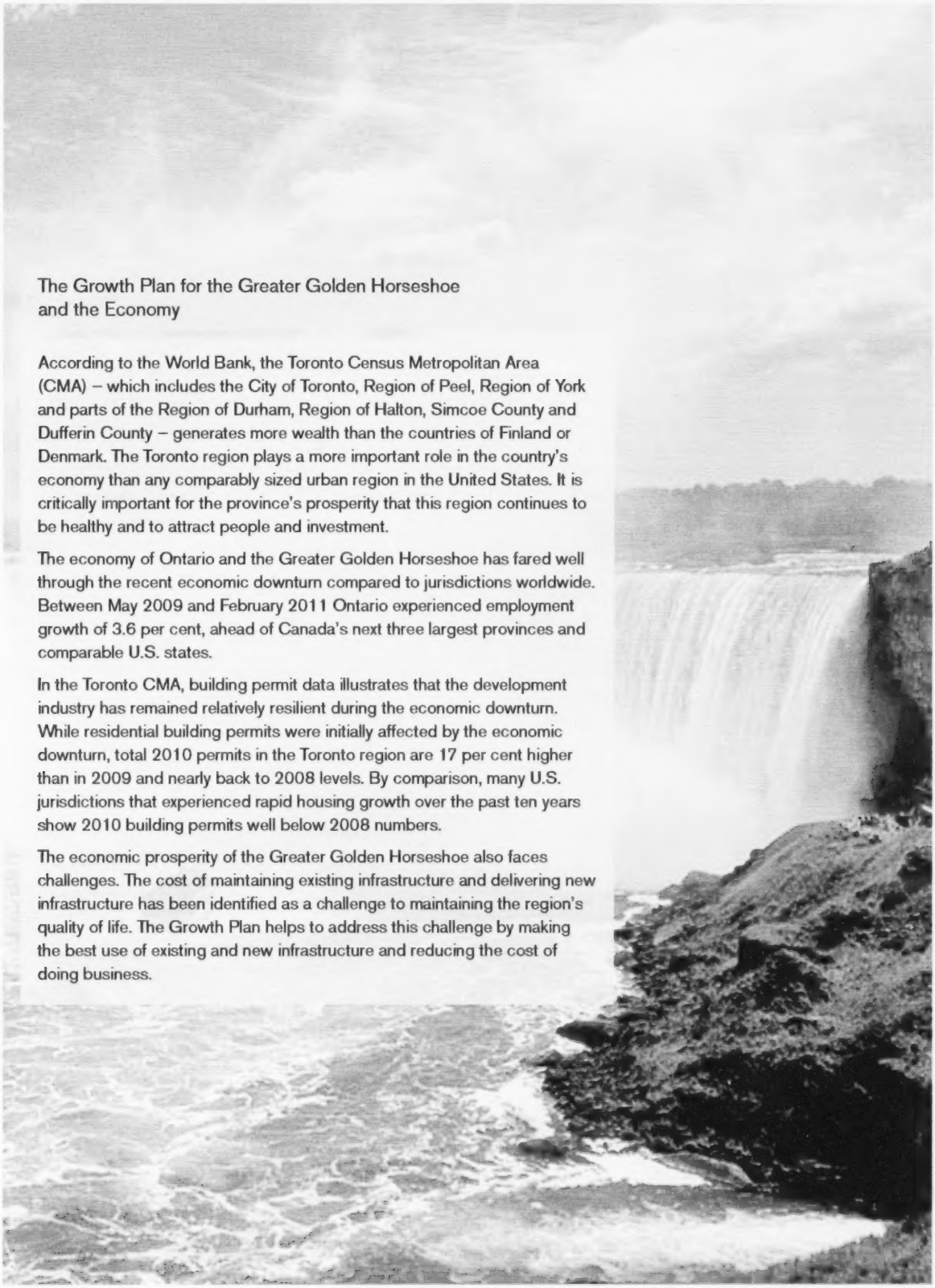
The Growth Plan for the Greater Golden Horseshoe and the Economy

According to the World Bank, the Toronto Census Metropolitan Area (CMA) – which includes the City of Toronto, Region of Peel, Region of York and parts of the Region of Durham, Region of Halton, Simcoe County and Dufferin County – generates more wealth than the countries of Finland or Denmark. The Toronto region plays a more important role in the country's economy than any comparably sized urban region in the United States. It is critically important for the province's prosperity that this region continues to be healthy and to attract people and investment.

The economy of Ontario and the Greater Golden Horseshoe has fared well through the recent economic downturn compared to jurisdictions worldwide. Between May 2009 and February 2011 Ontario experienced employment growth of 3.6 per cent, ahead of Canada's next three largest provinces and comparable U.S. states.

In the Toronto CMA, building permit data illustrates that the development industry has remained relatively resilient during the economic downturn. While residential building permits were initially affected by the economic downturn, total 2010 permits in the Toronto region are 17 per cent higher than in 2009 and nearly back to 2008 levels. By comparison, many U.S. jurisdictions that experienced rapid housing growth over the past ten years show 2010 building permits well below 2008 numbers.

The economic prosperity of the Greater Golden Horseshoe also faces challenges. The cost of maintaining existing infrastructure and delivering new infrastructure has been identified as a challenge to maintaining the region's quality of life. The Growth Plan helps to address this challenge by making the best use of existing and new infrastructure and reducing the cost of doing business.



- Basing land use patterns within settlement areas on densities and a mix of land uses which minimize negative impacts to air quality and climate change.
- Providing infrastructure and public service facilities in a coordinated, efficient and cost effective manner that considers impacts from climate change while accommodating projected needs. Planning authorities shall consider the potential impacts of climate change that may increase the risk associated with natural hazards.

Long-Term Energy Plan

In November 2010, Ontario released its Long-Term Energy Plan which sets the course for a clean energy transformation that is creating thousands of new jobs in Ontario, and helping ensure we have clean air to breathe in future generations.

The government's 20-year energy plan is building a clean energy future that provides a balanced mix of resources to power our homes and businesses. We are phasing out coal-fired generation by the end of 2014, investing in renewable energy to more than double our capacity, investing in and expanding our hydroelectric assets, and maintaining our commitment to clean, reliable nuclear power.

To develop the plan, the Ministry of Energy consulted with stakeholders about their views on key priorities for Ontario's electricity system going forward. Over 2,500 Ontarians submitted comments.

Growth Plan for the Greater Golden Horseshoe

The Growth Plan for the Greater Golden Horseshoe sets out objectives for how to accommodate and support population growth by creating complete, compact communities, curbing urban sprawl, revitalizing downtowns, increasing transportation and housing choices and protecting the environment. By introducing and implementing the Growth Plan, the Province is creating the conditions for a strong economy, vibrant communities and a healthy environment. Successful implementation of the Growth Plan will reduce car dependence and transportation-related greenhouse gas emissions.

Computer modelling has shown that implementation of the Growth Plan could help to conserve as much as 800 square kilometres of agricultural and rural land by 2031 – about the size of 100,000 soccer fields. A 2010 study by Quality Urban Energy Systems of Tomorrow (QUEST) found that the application of growth management policies such as the Growth Plan for the Greater Golden Horseshoe could reduce national annual greenhouse gas emissions from residential, commercial and personal transportation from five to 12 per cent while increasing transit ridership by more than 60 per cent.

The Ministry of Infrastructure recently completed a review of the population and employment forecasts of the Growth Plan. The review shows that the Greater Golden Horseshoe will continue to be one of the fastest growing regions in North America with the 2011 population of nine million reaching 13.5 million by 2041.

Immigration will continue to be the most significant driver of population growth in the Greater Golden Horseshoe. More than one third of all immigrants to Canada will settle in the Greater Golden Horseshoe.

The Growth Plan seeks to manage this rapid growth in a way that minimizes environmental, social and fiscal impacts. In 2011, the Ontario Growth Secretariat's five year anniversary update indicated the Growth Plan has made significant progress in helping the Greater Golden Horseshoe grow more sustainably.

The Greenbelt Plan

The Greenbelt Plan, which includes the Oak Ridges Moraine and Niagara Escarpment, is the cornerstone of the Growth Plan for the Greater Golden Horseshoe, Ontario's overarching strategy for managing growth in this area. The Greenbelt Plan identifies where major urban growth can occur, in order to provide permanent protection to 1.8 million acres of green space, agricultural land and the ecological features and functions occurring on this landscape.

Studies by IBI Group, Brookings Institution and Canada Mortgage and Housing Corporation have found that compact, smart growth development saves up to 30 per cent on capital costs and up to 15 per cent on operating costs for infrastructure compared to traditional development patterns.

Regional Transportation Plan

In 2008, Metrolinx adopted a regional Transportation Plan for the Greater Toronto Area, The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area (GTHA).

The Big Move aims to reclaim the GTHA's traditional transportation advantage, bolster our global competitiveness, protect our environment and improve our quality of life. Over 1,200 kilometres of rapid transit are planned – more than triple what exists now – so that over 80 per cent of residents in the region will live within two kilometres of rapid transit, with an emphasis on areas with large senior and low-income populations who rely on transit to get around daily.

Metrolinx will be reporting back to the Province by June 2013 with an investment strategy that includes proposed funding tools to support the implementation of The Big Move.

Far North Land Use Planning Initiative

The Government of Ontario has committed to working with First Nations to protect some 225,000 square kilometres of the Far North Boreal forest, peatlands, wetlands and tundra. The Far North of Ontario absorbs more than 12 million tonnes of carbon dioxide from the air each year and stores the equivalent of 97 billion tonnes of carbon dioxide.

Our long-term plans are designed to solve present day problems and achieve sustainable results for the future. A transition to a low-carbon economy is change that can be managed to provide long-range economic and environmental benefits.

SECTION 2: TRANSITIONING TO A LOW-CARBON ECONOMY

Shifting Away From Coal

Ontario is the only jurisdiction in North America committed to eliminating coal-fired electricity generation, the fastest-growing global energy source in the last decade.

(Source: IEA's Clean Energy Progress Report 2011)

In 2011, coal-fired electricity generation reached a 48-year low and emissions of carbon dioxide from coal plants decreased by nearly 90 per cent between 2003 and 2011.

We are on track to reach our goal of ending coal-fired electricity generation in Ontario by the end of 2014.

Our government closed two more coal-fired generation units at the end of 2011. Altogether, Ontario has shut down 11 of the province's 19 coal units. Eliminating coal-fired electricity generation by the end of 2014 is the equivalent of taking up to seven million cars off the road.

No other single climate change action implemented to date in North America will yield the significant results achieved by closing Ontario's coal-fired electricity generation and replacing it with a mix of cleaner natural gas and renewable energy.

In 2011, coal-fired electricity generation accounted for less than three per cent of all electricity produced in Ontario – the lowest level in 48 years. It is being replaced by cleaner sources of electricity such as wind, solar, nuclear and natural gas, and by reducing demand through conservation and smart grid technologies.

Replacing coal-fired electricity generation with clean energy

Our clean and renewable energy policies mean we have become a natural place to develop new sources of low-carbon energy and energy efficiency measures. By making more efficient use of energy and investing in clean technologies, Ontario businesses are becoming less energy-intensive. This has benefits in the short and long-term. New and diverse sources of low-carbon energy such as wind, solar, hydro, nuclear, natural gas and co-generation will lead to greenhouse gas emissions reductions.

Smart grid

The smart grid is intelligent electricity infrastructure that uses technology such as sensors, monitoring, communications, automation and computers to improve the flexibility, reliability and efficiency of the electricity system. A smart grid will:

- Empower Ontarians to better manage their electricity use and take advantage of conservation and small-scale generation opportunities
- Allow more renewable electricity generation, such as wind and solar power, to connect to the electricity grid
- Help utilities identify and fix outages more quickly
- Create business opportunities to provide innovative products and services to a growing market, creating jobs and sparking economic growth
- Enable electric vehicles to be charged conveniently.

Building a smart grid is not a single project but a series of integrated initiatives by a variety of organizations that work together to create a modern electricity system aligned with the digital age. Advancing the smart grid is a smart investment in our clean energy future and our economy.

By diversifying our energy sources and investing in smart grid technologies, we are protecting Ontario from energy supply and resilience issues. Continued investments in smart grid technology will increase the efficiency and reliability of Ontario's electricity sector, promote conservation and provide cost savings for Ontario homes and businesses.

As the global renewable energy and smart grid sectors expand, Ontario will be well-positioned to meet local demand and export energy technologies that are currently being tested, developed and used in the province.

Some of Ontario's successes include:

- Investments in smart meters, conservation programs and renewable energy sources, creating an environment that supports innovation in clean energy technology.
- Strong research capacity and capabilities in key technological areas such as nuclear, electric vehicles, energy storage, solar photovoltaic, smart grid and bio-energy.
- Our globally renowned utilities providing a 'testbed' for new technologies. For example, utilities from around the world have visited Hydro One to learn from its experience integrating electricity generated from many small local sources in rural areas, particularly wind, small-scale hydro, and small solar installations.

A Leader In The Clean Energy Economy

Building a leading clean energy economy that supports job creation and protects the environment

The Feed-In Tariff (FIT) program provides guaranteed long-term rates for renewable energy. It better positions Ontario to move forward on clean energy sources like wind, solar, bio energy, and waterpower that will create jobs. There are currently 12,000 Ontarians participating in FIT. Projects with local participation will help encourage support in host communities and will result in significant local economic and employment opportunities.

In April 2012, Ontario launched its Clean Energy Economic Development Strategy, which will leverage the province's clean energy experience to become a global leader in key areas of the energy sector. Developing a Clean Energy Economic Development Strategy was a key recommendation from the 2012 Feed-In Tariff Two Year Review. The Strategy will continue our progress in solar and wind energy by supporting companies that are looking to export their Ontario-made products and services to the world. It also capitalizes on our global leadership in smart meters and the smart grid, including grid automation, data management and consumer-facing ways to engage Ontarians in their energy usage.

As part of Ontario's Clean Energy Economic Development Strategy, Ontario established the Ontario Clean Energy Task Force to help broaden Ontario's energy focus by providing advice on ways to increase collaboration among industry, the utilities, academia and government; identifying the challenges that innovative companies face in implementing new clean energy technologies and services in Ontario; and helping identify export opportunities. The Clean Energy Task Force will engage energy experts from the industry and associations to help maintain Ontario's competitive advantage in clean energy technologies.

Boosting our economy through investments and innovation in clean technology

According to a research report by HSBC, it is estimated that low-carbon energy markets will triple to $2.2 trillion US by 2020. Ontario is poised to

TAKING ACTION:

Ontario's Feed-in Tariff

Ontario's Feed-in Tariff Program and Green Energy Investment Agreement (GEIA) will attract a total of $27 billion in private sector investment to the clean energy industry. Our clean energy initiatives have added 20,000 new jobs to Ontario and we are on track to create 50,000 clean energy jobs.

Since October 2003, more than 2,500 megawatts (MW) of renewable energy capacity has come online. Over that period, Ontario has also signed more than 28,000 renewable energy supply contracts from wind, water, solar and bio-energy.

be a leader in these markets because it has one of the most advanced, efficient and sustainable energy systems in North America, making it a hub for innovation.

Ontario is taking forward-thinking action to ensure the province encourages innovation in clean technology and maintains its competitive advantage in the area of clean energy.

The Ontario government is working with industry on innovative low-carbon technology. For example, the Province recently:

- Recognized, ahead of schedule, the use of low-carbon cement in Ontario's Building Code. Carbon emissions are produced when cement is made because the limestone used needs to be heat-treated. Carbon dioxide is released from burning fuel and the chemical reaction of calcination that combines raw materials in the making of cement. The Building Code standard allows 15 per cent of the limestone used to be untreated.
- Encouraged pilot testing of new biomass and alternative fuels and technologies as promising ways of reducing fossil fuel use and related greenhouse gases.

Ontario businesses continue to show great leadership through independent and voluntary investment in clean technologies. Many of these developing technologies will not only help drive greenhouse gas reductions, but provide an immediate and long-term economic boost to Ontario's growing clean economy.

We are already seeing emissions reductions from Ontario's industrial sectors. Greenhouse gases emitted from industrial sources within the province have decreased significantly since the release of our action plan in 2007, due in part to reduction of industrial energy demand through use of demand side management (DSM) tools.

LEADERSHIP:

General Electric Grid IQ Centre

On March 8, 2011, General Electric (GE) in partnership with the Ontario government announced the establishment of the GE Grid IQ Innovation Centre in Markham. The new 20,000 square foot Centre will develop and manufacture smart grid products and services to help Ontario's power grid. The centre will also include a smart grid demonstration centre and lab facility, which will be used to showcase GE's products and services to customers. Ontario is putting $7.9 million towards the project, and GE is investing $40 million. This new global centre of excellence will create 146 new highly-skilled jobs.

Demand Side Management (DSM) Tools

These are measures undertaken to control the level of energy usage at a given time, by increasing or decreasing consumption or shifting consumption to some other time period.

LEADERSHIP:

BESTECH – Sudbury, ON

Founded by co-CEOs Marc Boudreau and Denis Pitre in 1995, BESTECH has designed and developed software products that enable companies in the mining industry to increase efficiency, reduce energy costs, improve worker safety and diminish harmful greenhouse gas emissions.

NRG1-ECO™ is a mine-wide energy management solution that can greatly reduce a mine's energy consumption. AQM™ is a web-based ambient air quality monitoring system that offers a variety of options for acquiring and distributing data to various environmental and operational stakeholders who require real-time information about production emission processes.

The company has expanded nationally with contracts in Labrador and the Northwest Territories, as well as the United States, Mexico, Chile, Peru and Australia.

TAKING ACTION:

Supporting Ontario's Bioeconomy

New innovation and creativity in the bioeconomy helps support northern and rural economies, creates new business opportunities, supports sustainable growth and generates new wealth. Ontario is making use of its abundant supply of forest biofibre, industrial capacity, infrastructure and expertise to replace non-renewable inputs for the production of biomaterials, bioenergy, biopharmaceuticals and other bioproducts. A provincial wood supply competition resulted in forty-two successful proposals representing a total of 5.2 million cubic metres of unused wood supply. Over 70 per cent of that total went to the bio-products sector, such as biofuels, energy and pellets. The use of forestry products and/or waste to increase the amount of energy, biofuels and industrial products, lessens our dependence on fossil fuels and reduces net emissions of greenhouse gases and persistent toxic substances, thereby improving environmental and human health.

We have to take a long-term view when addressing climate change. The regeneration of our forests, achieved through prudent and sustainable management over a relatively short period compared to other non-renewable materials, means products made from biofibre can be considered a cleaner, greener alternative.

SECTION 3: REDUCING SECTOR GREENHOUSE GAS EMISSIONS

In addition to reducing greenhouse gas emissions in the industrial sector and from commercial, industrial and residential buildings, we are also focused on reducing emissions in the transportation, agriculture, waste and government sectors.

Transportation

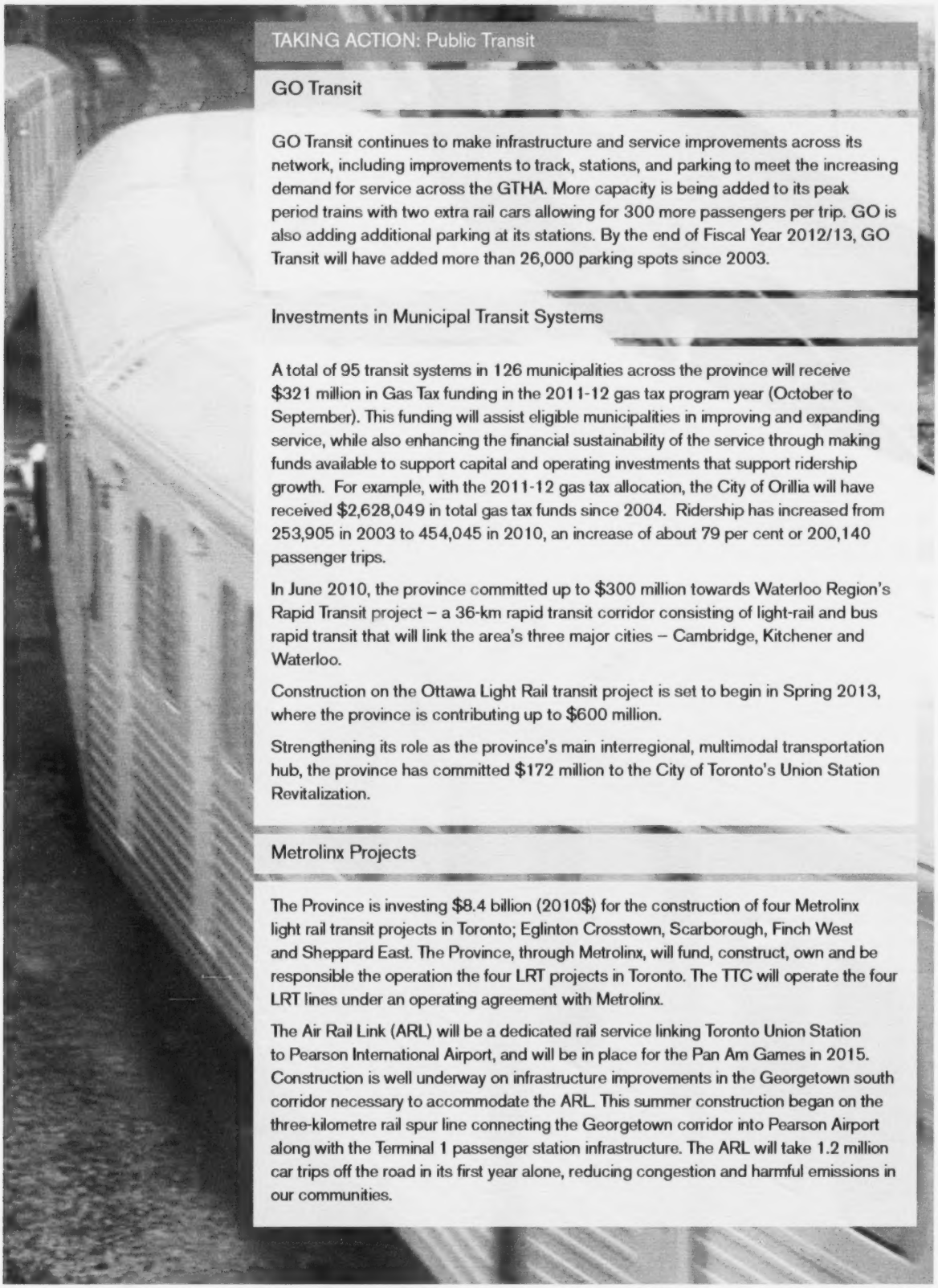
We face a number of complex challenges with respect to reducing greenhouse gas emissions from our growing transportation sector. Ontario is continuing to invest in public transit to support cleaner transportation and make it easier for people to reduce their transportation costs.

Across North America, cars and trucks are an increasing source of greenhouse gas emissions and air pollution. In addition to health and climate impacts, more cars and trucks also mean more traffic congestion in Ontario.

Despite the challenges posed by this issue, continuing to invest in public transit will have significant benefits for communities, the environment and economy. As people are able to live closer to work, schools and services, they enjoy a better quality of life. It also makes it easier for people to choose cleaner forms of transportation for getting around.

The main plank of our transportation strategy is to improve and broaden our public transit system, especially in high-density areas across the province, but it also includes improving our highway system to encourage carpooling and programs and incentives to reduce emissions in the sector.

Since 2003, we have invested a record $13.4 billion in public transit, including $6 billion in GO Transit, to ease congestion, save on fuel costs and protect the environment. Creating an environment that supports transit ridership is an important element in building more sustainable communities.



TAKING ACTION: Public Transit

GO Transit

GO Transit continues to make infrastructure and service improvements across its network, including improvements to track, stations, and parking to meet the increasing demand for service across the GTHA. More capacity is being added to its peak period trains with two extra rail cars allowing for 300 more passengers per trip. GO is also adding additional parking at its stations. By the end of Fiscal Year 2012/13, GO Transit will have added more than 26,000 parking spots since 2003.

Investments in Municipal Transit Systems

A total of 95 transit systems in 126 municipalities across the province will receive $321 million in Gas Tax funding in the 2011-12 gas tax program year (October to September). This funding will assist eligible municipalities in improving and expanding service, while also enhancing the financial sustainability of the service through making funds available to support capital and operating investments that support ridership growth. For example, with the 2011-12 gas tax allocation, the City of Orillia will have received $2,628,049 in total gas tax funds since 2004. Ridership has increased from 253,905 in 2003 to 454,045 in 2010, an increase of about 79 per cent or 200,140 passenger trips.

In June 2010, the province committed up to $300 million towards Waterloo Region's Rapid Transit project – a 36-km rapid transit corridor consisting of light-rail and bus rapid transit that will link the area's three major cities – Cambridge, Kitchener and Waterloo.

Construction on the Ottawa Light Rail transit project is set to begin in Spring 2013, where the province is contributing up to $600 million.

Strengthening its role as the province's main interregional, multimodal transportation hub, the province has committed $172 million to the City of Toronto's Union Station Revitalization.

Metrolinx Projects

The Province is investing $8.4 billion (2010$) for the construction of four Metrolinx light rail transit projects in Toronto; Eglinton Crosstown, Scarborough, Finch West and Sheppard East. The Province, through Metrolinx, will fund, construct, own and be responsible the operation the four LRT projects in Toronto. The TTC will operate the four LRT lines under an operating agreement with Metrolinx.

The Air Rail Link (ARL) will be a dedicated rail service linking Toronto Union Station to Pearson International Airport, and will be in place for the Pan Am Games in 2015. Construction is well underway on infrastructure improvements in the Georgetown south corridor necessary to accommodate the ARL. This summer construction began on the three-kilometre rail spur line connecting the Georgetown corridor into Pearson Airport along with the Terminal 1 passenger station infrastructure. The ARL will take 1.2 million car trips off the road in its first year alone, reducing congestion and harmful emissions in our communities.

TAKING ACTION:

Electric Vehicles

As part of our Electric Vehicle Incentive Program, Ontario businesses, individuals and organizations are eligible for an incentive of up to $8,500 towards the purchase or lease of a new plug-in hybrid electric or battery electric vehicle. Also, because of the Province's continued commitment to electric vehicles (EV), last year, Woodstock's Toyota plant was chosen to produce the Toyota RAV4 EV. The total investment is helping to protect 6,500 jobs and thousands of supplier jobs throughout the province.

In January 2012, the Province published the Transit-Supportive Guidelines, which includes a distillation of transit-friendly land use planning, urban design and operational practices, drawing from experiences in Ontario, North America and abroad. By providing municipalities across Ontario with strategies, case studies and resources to develop more transit-supportive communities, these guidelines will play an important role in helping municipalities plan for transit and greener communities.

In consultation with the Ministry of the Environment and Environment Canada, the Ministry of Transportation completed, in 2012, a comprehensive and detailed guide; Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects. This guide defines the methodology to assess and mitigate the long-term air quality and GHG emission implications of road transportation projects.

Adherence to the guide will help minimize emissions and their environmental and human health impacts through judicious planning and design.

Cutting emissions through Ontario's Long Combination Vehicles (LCV) Program

LCVs can move goods at a lower cost and with fewer greenhouse gas emissions (GHG) than single tractor-trailers. LCVs are made up of one tractor pulling two full-length semi-trailers. Each LCV uses about one-third less fuel than the two tractor-trailers it replaces. That means one-third less greenhouse gas emissions for each LCV on the road.

Between August 2009 and March 2012, LCVs completed over 45,500 trips covering 14.8 million kilometres of travel. This produced an estimated diesel fuel savings of 2,967,457 litres, and avoided an estimated 8,300 tonnes of GHG emissions from entering the air.

We are also supporting the use of electric vehicles and seeing results. Ontarians are beginning to use electric vehicles in increasing numbers. With the phase-out of coal, Ontario becomes an ideal place to use electric vehicles as clean energy continues to make up a greater share of our available energy.

Agriculture

Climate change is having an increasing impact on our agricultural sector as rising global greenhouse gas emissions contribute to increasingly unpredictable weather patterns worldwide. We continue to take action to mitigate climate change by working with agricultural producers and agri-product businesses through a variety of programs and initiatives, and by supporting the adoption of best management practices, research and innovation. Examples include:

- **The Environmental Farm Plan**, a voluntary program that enables farmers to learn and implement best management practices that can provide economic and environmental benefits. Practices under the plan that support the reduction of greenhouse gas emissions include manure management, feed efficiency and livestock management, nutrient management planning, precision agriculture, farm energy audits, farm energy and water conservation measures.
- **The Ontario Biogas Financial Assistance Program**, completed in 2010, successfully led to more than 11 megawatts (MW) installed electrical capacity, enough power for 10,000 homes. It supported greenhouse gas emission reductions by direct avoidance of emissions from manure storage and offsetting emissions by replacing fossil fuel generated electricity or natural gas.
- **The Ontario Ethanol Growth Fund** has helped create an industry with domestic production that is currently at 885 million litres per year, projected to grow to over one billion litres per year. This initiative has created over 360 skilled jobs in rural Ontario, generated over $635 million in capital investment and continues to contribute to improved air quality in Ontario. Ontario has seven ethanol facilities in place.

In 2007, diversion of Blue Box, municipal hazardous and electronic waste in Ontario resulted in nearly 7,000 jobs which paid above the provincial average and added $673 million to Ontario's gross domestic product.

Waste

Ontario is taking advantage of the many opportunities that exist to reduce greenhouse gas emissions in the way we manage waste in the province.

We recognize that some of the best opportunities to reduce greenhouse gas emissions come from reducing the amount of waste that needs to be managed. This reduces emissions from manufacturing and shipping, and supports a greener economy.

Waste diversion results in fewer greenhouse gas emissions than if the waste was landfilled. Waste diversion programs such as Blue Box, Municipal Hazardous or Special Waste, and the Waste Electrical and Electronic Equipment Program help our province avoid emissions of 2.2 million tonnes a year of greenhouse gases.

This includes 1.8 million tonnes of greenhouse gases avoided through the diversion of printed paper and packaging (Blue Box), nearly 14,000 tonnes of GHGs avoided through the diversion of municipal hazardous wastes such as paints and pesticides, and about 380,000 tonnes of GHGs avoided through the diversion of electronic waste such as televisions, computers and printers.

Since 2008, Ontario requires landfill gas collection and use or flaring for new and operating landfills larger than 1.5 million cubic metres. Currently, 26 of Ontario's 31 largest landfills required to collect landfill gas are now collecting it, with more scheduled to come online as collection systems are installed and sites developed.

As part of Ontario's waste action plan, new composting standards will take effect on January 1, 2013 with some requirements for existing composting facilities being phased in by July 1, 2015. We have updated our compost framework to increase opportunities for turning organics into a resource while ensuring compost use continues to be protective of the environment and human health.

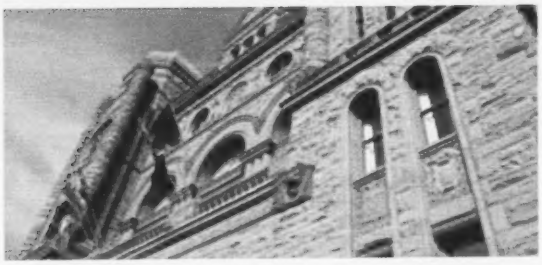
Government

The Ontario government has established itself as a leading green organization and has been recognized as one of Canada's Greenest Employers three years in a row.

Ontario set targets to reduce its carbon footprint from direct operations by 19 per cent below 2006 levels by 2012 and 27 per cent by 2020. The Ontario Public Service Green Transformation Strategy has led to substantial progress.

Key initiatives include:

- Reducing electricity consumption by nearly 50 million kilowatt hours (kWh) – enough energy to power 4,504 houses for one year through consolidating data servers, desktop computer power management and a Green Print Strategy that will eliminate over 13,000 print devices and reduce paper consumption by 50 per cent.
- The Guelph Data Centre, opened in 2011, is a Leadership in Energy and Environmental Design (LEED) Gold-certified building. Renewable energy is being piloted at provincial parks, fire management headquarters and remote airports. Greening Ontario's buildings is ongoing and helps conserve energy and reduce GHG emissions.
- Increasing the efficiency of Ontario's vehicle fleet through right-sizing and fuel efficient technologies including, as of March 2012, 1,155 hybrid vehicles – an increase from 103 in 2006, saving over one million litres of fuel per year – and 25 electric vehicles. Vehicle GHG emissions decreased 10.9 per cent – from 98.3 kilotonnes in 2006/07 to 87.6 kilotonnes in 2011/12.
- Greenhouse gas emissions from government air travel decreased 19.9 per cent over the same period.



Preparing the Broader Public Sector for a Low-Carbon Future

In August 2011, Ontario filed a new regulation that requires Ontario's broader public sector (BPS), including schools and hospitals, to develop and implement energy conservation plans.

BPS organizations will be required to report on energy use and greenhouse gas emissions beginning July 1, 2013 and to develop energy conservation plans beginning July 1, 2014. Complying with this regulation will help BPS organizations better manage their energy consumption and reduce their greenhouse gas emissions.

SECTION 4: ENERGY EFFICIENCY AND CONSERVATION

Energy conservation at every level yields significant reductions in greenhouse gas emissions. If we adjust our living and working strategies so we use less electricity, less gas and diesel and employ general recycling and reduction strategies, we will make a collective impact on emissions reductions and see a positive "ripple" effect across the province. When it comes to conservation, the old rule of "less is more" certainly applies.

Encouraging Energy Efficiency and Conservation Practices

Ontario is reducing greenhouse gas emissions by encouraging businesses and individuals to reduce their energy consumption. Conserving energy saves money for families and businesses and lowers demand on the electricity system.

Ontario is working with the Ontario Power Authority and local distribution companies (LDCs) to offer energy conservation incentives to households and businesses. Examples include the Fridge and Freezer Pickup program, heating and cooling incentives, peaksaver® (a residential and commercial demand management program), and a range of energy efficiency and demand response programs for commercial, institutional and industrial customers.

The Green Energy and Green Economy Act, 2009, modified the way conservation is implemented in Ontario, allowing energy conservation to become an integral part of the Local Distribution Utility's mandate. Under a new four-year framework starting January 1, 2011, Ontario's LDCs have been given mandatory electricity conservation targets as part of their license condition from the Ontario Energy Board. The aggregate targets for all LDCs are 1,330 megawatts of provincial peak demand savings and 6,000 gigawatt hours of cumulative energy by the end of 2014.

LEADERSHIP:

Reduce the Juice

Based in Waterloo, Reduce the Juice (RTJ) is a youth-led climate change organization that helps create projects to reduce carbon emissions.

RTJ was started by three former members of the non-profit renewable energy co-operative Power Up Renewable Energy in 2005 in Shelburne. The group saw the need for youth to get involved and take hands-on action on climate change in their own community. RTJ projects tend to be one of two kinds: community-based, or school-based. The organization started out with a transportation focus, but has branched out to other areas such as energy and water conservation.

"We believe that climate change is one of the largest challenges that the youth of today are going to have to confront and we also believe that with a little help they are capable of tackling it head on in their own communities." says Director Sara Wicks.

In 2009, RTJ completed their "Driving Home and Emissions Free Future Project II" which included anti-idling campaigns and a summer outreach campaign resulted in 671 pledge forms (which would result in GHG reductions of 625 tonnes/year GHG). Also, a Waterloo Collegiate Institute school campaign collected 586 pledges from students committing to more sustainable transportation to and from school.

This past summer, RTJ focussed on reducing the amount of greenhouse gas emissions that occur due to organic waste being placed into landfills by increasing residential participation in Waterloo Region's Green Bin program.

"We hope to become a supportive platform or 'project incubator' for students who are looking to start initiatives to tackle climate change." says Wicks.

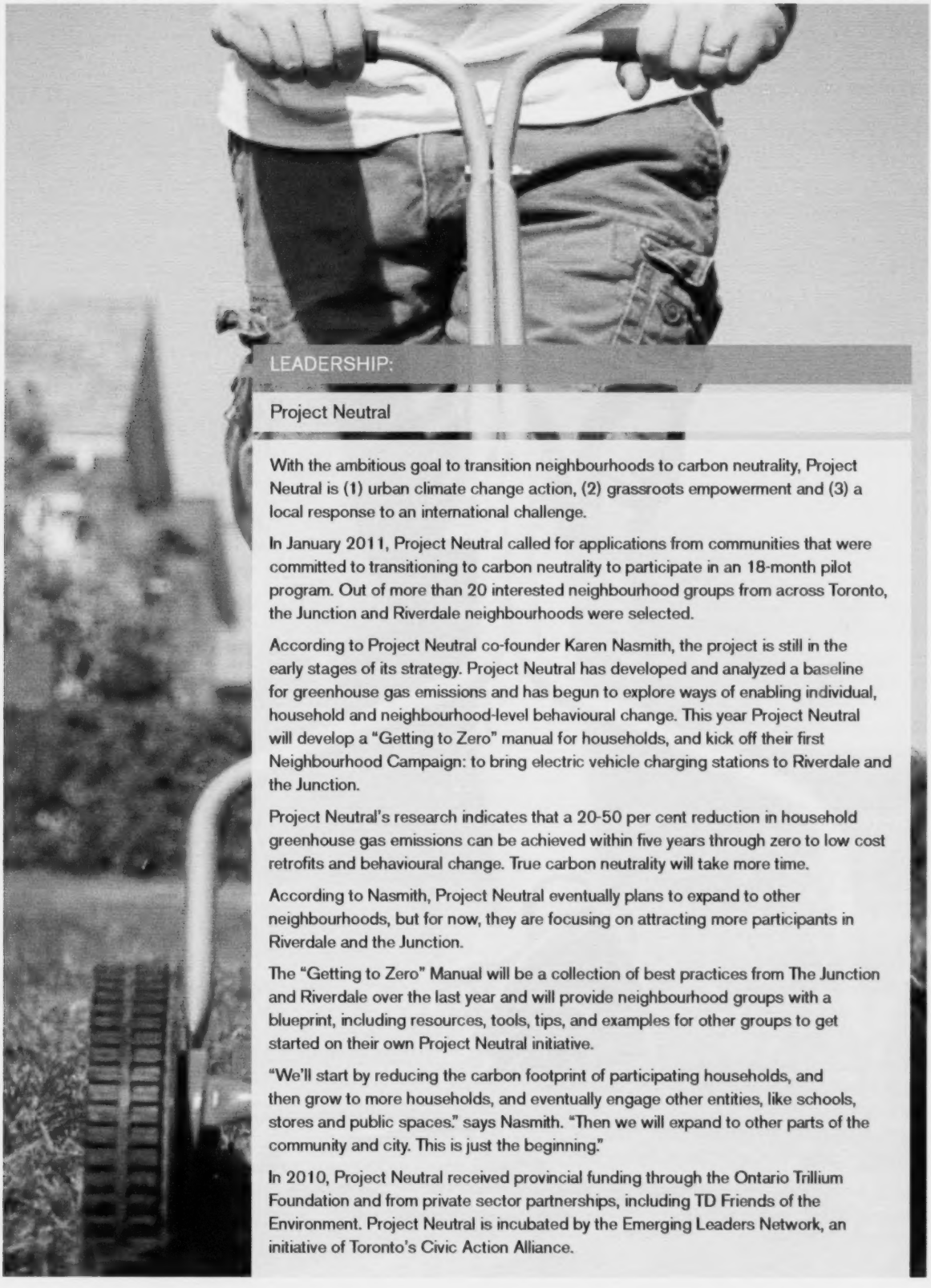
A new suite of electricity conservation programs was launched in 2011 under the saveONenergy banner. The province-wide programs, to be delivered between 2011 and 2014, are designed to encourage customers to invest in electricity conservation measures, which in turn will help them manage their electricity bills.

Ontario is continuing to take a leadership role in enhancing the energy efficiency of products and appliances which are helping to transform the market.

Ontario is committed to phasing out inefficient lighting and encouraging the use of more energy-efficient alternatives, such as LEDs or compact fluorescents. The province proposes to harmonize compliance dates for incandescent light bulbs with the federal government. Beginning January 1, 2014, the import of inefficient incandescent lighting will be banned in all provinces across Canada.

Reducing emissions from residential, commercial and institutional buildings is a key part of Ontario's Climate Change Action Plan. Energy efficient buildings help minimize overall greenhouse gas emissions and energy costs.

The cornerstone of our emissions reduction plan for buildings is Ontario's Building Code. The Building Code, which has phased in higher energy efficiency requirements for new buildings over time, plays a significant role in limiting greenhouse gas emissions while allowing businesses and residents the flexibility to move forward in a cost-efficient manner.



LEADERSHIP:

Project Neutral

With the ambitious goal to transition neighbourhoods to carbon neutrality, Project Neutral is (1) urban climate change action, (2) grassroots empowerment and (3) a local response to an international challenge.

In January 2011, Project Neutral called for applications from communities that were committed to transitioning to carbon neutrality to participate in an 18-month pilot program. Out of more than 20 interested neighbourhood groups from across Toronto, the Junction and Riverdale neighbourhoods were selected.

According to Project Neutral co-founder Karen Nasmith, the project is still in the early stages of its strategy. Project Neutral has developed and analyzed a baseline for greenhouse gas emissions and has begun to explore ways of enabling individual, household and neighbourhood-level behavioural change. This year Project Neutral will develop a "Getting to Zero" manual for households, and kick off their first Neighbourhood Campaign: to bring electric vehicle charging stations to Riverdale and the Junction.

Project Neutral's research indicates that a 20-50 per cent reduction in household greenhouse gas emissions can be achieved within five years through zero to low cost retrofits and behavioural change. True carbon neutrality will take more time.

According to Nasmith, Project Neutral eventually plans to expand to other neighbourhoods, but for now, they are focusing on attracting more participants in Riverdale and the Junction.

The "Getting to Zero" Manual will be a collection of best practices from The Junction and Riverdale over the last year and will provide neighbourhood groups with a blueprint, including resources, tools, tips, and examples for other groups to get started on their own Project Neutral initiative.

"We'll start by reducing the carbon footprint of participating households, and then grow to more households, and eventually engage other entities, like schools, stores and public spaces." says Nasmith. "Then we will expand to other parts of the community and city. This is just the beginning."

In 2010, Project Neutral received provincial funding through the Ontario Trillium Foundation and from private sector partnerships, including TD Friends of the Environment. Project Neutral is incubated by the Emerging Leaders Network, an initiative of Toronto's Civic Action Alliance.

On January 1, 2012, Ontario's Building Code required that new houses must meet the performance level that is equal to a rating of 80 or more when evaluated against the EnerGuide Rating System. An average house built in 2012 is approximately 40 per cent more energy efficient than a house built in 2006, when these requirements were introduced. Since January 1, 2012, the energy efficiency level for newly constructed large buildings, such as highrise condominiums, must meet or exceed a level that is 25 per cent higher than the 1997 Model National Energy Code for Buildings. Ontario's requirements for large buildings are the most stringent in North America.

A new edition of the Building Code was recently filed that includes changes to energy efficiency requirements that will be mandatory for new construction in 2017. These include enhancements of 15% for houses and 13% for large buildings relative to current requirements that already make Ontario a North American leader.

SECTION 5: COLLABORATION AND COOPERATION

Collaboration and cooperation are cornerstones of Ontario's Climate Change Action Plan and Climate Ready strategies. Our approach has been to work with our partners to create connected initiatives that are led by strong government action and supported by partnerships with municipalities, organizations, institutions, businesses, North American and international jurisdictions and contributions from various sectors and citizen groups.

The Regional Adaptation Collaborative – a joint federal and provincial program – and the Community Adaptation Initiative are examples of collaboration that benefit Ontario and the rest of the country. The Province, community decision-makers within municipalities, conservation authorities and other partners worked together to increase adaptation knowledge and expertise at the local level.

The Ontario Regional Adaptation Collaborative was a $6.8 million initiative led by the Ontario Ministry of the Environment with participation from the Ministry of Municipal Affairs and Housing and the Ministry of Natural Resources. Partner ministries worked with seven Ontario-based partners to develop tools and resources to address climate change impacts. Projects include:

- A web portal called the Weather and Water Information Gateway that provides standardized data that municipalities, conservation authorities and others can use to assess their vulnerabilities to climate change and to facilitate community level decision-making related to climate change impacts. Five communities were chosen to pilot the effectiveness of the Gateway. These case studies are models for other communities dealing with flooding, storm water management, low water response, source water protection, and Northern community risk management, demonstrating how the Gateway can support local planning.
- A Toronto Public Heath (TPH) project to improve the way we plan for and react to extreme heat events. TPH undertook a pilot study using Geographic Information Systems (GIS) mapping to coordinate extreme heat response plans that show areas most impacted by heat events, as well as population data that identify clusters of particularly vulnerable populations.

Preparing for and responding to the impacts of climate change is known as adaptation and is critical to protecting our health, safety, environment and economy.

Adapting to climate change involves taking action to reduce or eliminate the negative effects of climate change while taking advantage of the positive effects.

- Training and outreach for rural and resource-based communities provided by the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR). Recipients of this training were engaged in the process of refining tools to their local conditions and concerns, enabling adaptation planning. This allowed training and support materials to be very specific to the location and socio-economic context of the community.

TAKING ACTION:

Community Adaptation Initiative

The Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR), in partnership with the Clean Air Partnership, received $460,000 in funding from the Province to operate the Community Adaptation Initiative from 2010 to 2012. The Community Adaptation Initiative uses case studies, videos, webinars and citizen conferences, in addition to five technical workshops to help practitioners in at-risk sectors protect themselves from climate-related impacts. Topics covered include: public health, urban forestry, electricity, high-rise residential buildings, emergency management and critical infrastructure. All resources from the Community Adaptation Initiative are available online: http://www.climateontario.ca

Many of the tools and resources that have been developed to support local communities in Ontario are available online. The solutions developed through these projects will be shared nationally to ensure that Canadian communities are well-positioned to make appropriate decisions as the climate changes.

Continued collaboration with other North American and international jurisdictions will make Ontario's actions to reduce greenhouse gas emissions more effective.

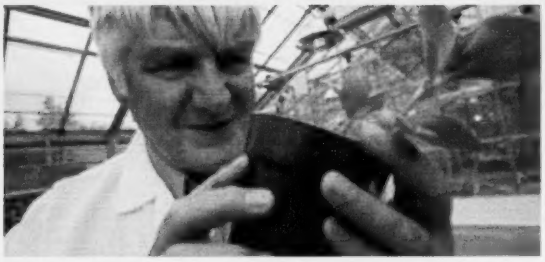
The Western Climate Initiative (WCI) is working to identify, evaluate, and implement emissions trading policies to tackle climate change at a regional level. We are working with our WCI partners – Quebec, Manitoba, British Columbia and the State of California – to put the necessary infrastructure and administrative support in place to support a regional greenhouse gas emissions trading program.

Ontario is also a participant in the North America 2050 collaboration, which brings provinces and states together to strengthen efforts to design, promote and implement cost-effective policies that reduce greenhouse gas emissions and create economic opportunities. Ontario's participation in North America 2050 allows us to learn from experts in other jurisdictions, collaborate on the development of initiatives to address greenhouse gases in North America and promote consistency across jurisdictions.

We continue to seek a stronger partnership with the federal government as we work together to meet our provincial and national climate goals. One of the ways that we are working to ensure a stronger partnership is by seeking an equivalency agreement with the federal government for greenhouse gas requirements for the industrial and electricity sectors.

Under an equivalency agreement, federal regulations would not apply where it can be demonstrated that Ontario's measures achieve the same or better environmental outcome. This would avoid duplication and allow Ontario to regulate greenhouse gases in a way that makes sense for the province. An equivalency agreement would help ensure Ontario industry achieves real reductions in a flexible and cost efficient manner while contributing to a national framework for greenhouse gas reductions.

By the end of 2012, Ontario will begin work with the federal government to demonstrate that Ontario's approach to greenhouse gas reductions from large emitters would achieve the same or better environmental outcomes as the developing federal approach, with the goal of achieving equivalency with federal requirements.



SECTION 6: PREPARING FOR CLIMATE CHANGE

Climate Science

Preparing for the impacts of climate change and applying adaptation strategies is a long-term process that will evolve as we learn more about climate change and its effects.

For a detailed appendix of Ontario's adaptation initiatives, please download the PDF from our website:

For the English report:
http://www.ene.gov.on.ca/environment/en/resources/STDPROD_100825

For the French report:
http://www.ene.gov.on.ca/environment/fr/resources/STDPROD_100827

In partnership with Canadian universities and leading research institutions, we have developed Ontario-focused climate data, which will help us understand the impacts of climate change on the province. For example, we successfully completed regional climate modelling that provides more detailed projections of temperature and precipitation changes for the different regions of Ontario. Regional climate models may offer a useful tool to assist the assessment of vulnerability and development of adaptation options. Climate models have also been combined with bio-physical models to help project changes in our natural resources as a result of climate change.

In 2011, the Province established an Ontario Public Service Climate Modelling Collaborative to bring together users of climate science within the government to understand what gaps exist in the current science, how to fill those gaps and how to deliver the science in a way that is understood by all users.

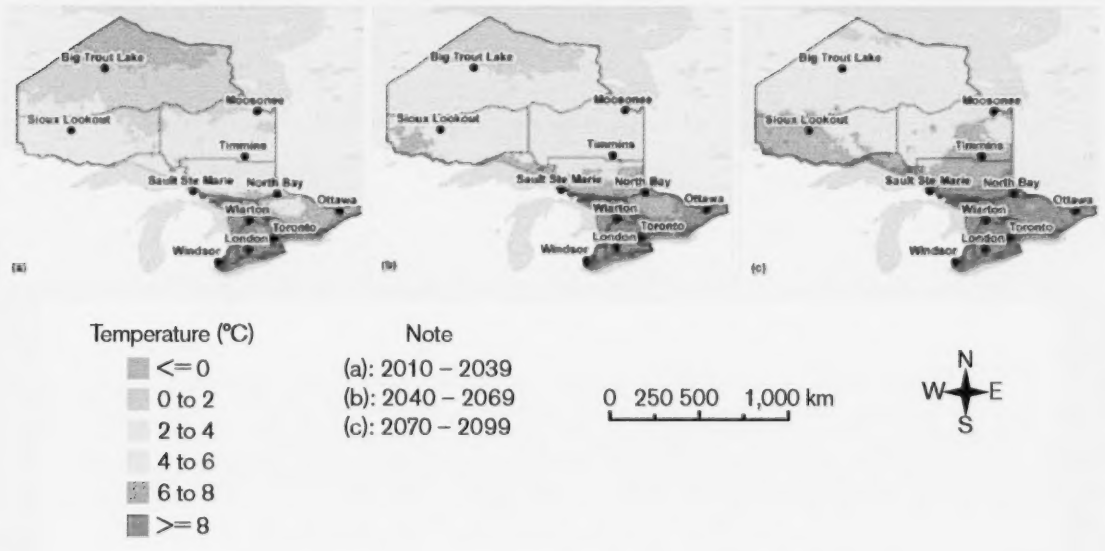
To help partners understand the science, we worked with Toronto Region and Conservation Authority to ensure technical training is available to planners and resources managers to help them prepare plans that consider how to protect drinking water and other resources through adaptation measures.

Changes in climate can result in economic impacts as well. To get a better understanding of what impacts a changing climate are having on key economic

sectors such as winter tourism, agriculture, infrastructure and energy, we are undertaking a climate impact indicator study. The Province will identify trends and indicators to track direct economic, social and environmental impacts of climate change to help Ontarians better understand the scope of impacts that our province faces.

Reducing our exposure to risks and taking advantage of opportunities is the only prudent course of action to protect our families, our natural resources and the environment, and secure our business investments.

FIGURE 1
MEAN ANNUAL TEMPERATURE 2010 – 2099 FOR THREE TIME PERIODS
(A) 2010-2039, (B) 2040-2069, (C) 2070-2099[3]



3 University of Regina. July 2011. Regional Climate Modelling Over Ontario Using UK PRECIS. Study used the United Kingdom Providing Regional Climates for Impact Studies (PRECIS) model at 25-kilometer resolution and further downscaled to 10-kilometer results for the period 2010-2099. The Hadley Center global climate model (HadCM3Q) results under scenario A1B was used to drive PRECIS.

TAKING ACTION:

Carbon Flux Monitoring

The Ministry of the Environment established two carbon flux monitoring stations in the Kinoje Lakes and Attawapiskat River regions of the Hudson Bay Lowlands, a globally significant carbon store, in 2009 and 2010 respectively. Near continuous measurements of baseline environmental data and information on carbon exchange (carbon storage, carbon sequestration) have been captured since the two stations were deployed. Successful collaborations have been established with the Ontario Ministry of Natural Resources, the Attawapiskat First Nation, DeBeers Canada, and six Canadian universities. These collaborations allow the ministry to coordinate maintenance/operational activities, share resources and expertise, optimize data collection activities, and minimize costs. The ministry formally sponsored two successful Natural Sciences and Research Engineering Council of Canada (NSERC) strategic grant proposals led by McGill University and Sir Wilfred Laurier (~$600,000 and ~$2,000,000 respectively) that will make use of the data being collected by the ministry's monitoring stations to develop, validate and refine policy tools (for example, ecosystem models, remote sensing techniques). Two years of collected data has been processed and reviewed for quality and will be released to key stakeholders, followed by the general public, in 2012-2013.

Ontario Research Fund and the Early Researcher Awards

The Ministry of Economic Development and Innovation supports scientific investigation into climate change through the Ontario Research Fund and the Early Researcher Awards. The Ontario Research Fund helps cover operating and capital costs associated with cutting-edge research. The Early Researcher Awards help promising, recently-appointed Ontario researchers build their research teams of undergraduates, graduate students, post-doctoral fellows, research assistants, associates, and technicians.

These research programs are currently funding investigators working on the causes and effects of climate change, as well as how people, plants, and animals are adapting. These researchers are active throughout Ontario, as well as in the Arctic.

Dr. John C. Lin, University of Waterloo

Climate change is particularly pronounced in the higher latitudes, where Ontario's borders are found, and has profound consequences for agriculture and water resources. As the province with the largest number of farms, Ontario needs accurate predictions of future climate to help resource managers and policy makers manage risks arising from climate change. Dr. Lin's work, supported by the Early Researcher Awards program, will refine Ontario's capability to predict the future climate by improving understanding of the current-day climate with observations and cutting-edge computer models.

Dr. Luke Copland, University of Ottawa

Major changes in the arctic ice cap and in Canadian glaciers are recognized as important indicators of global climate change. Despite this, there are great gaps in our knowledge of what, precisely, is happening to arctic ice. Supported by the Ontario Research Fund, Dr. Copland's lab is dedicated to measuring, observing and monitoring glaciers and ice caps. The ice fields of northern Canada are currently poorly monitored, even though they contain the largest volumes of ice in the world outside of Greenland and Antarctica. Understanding changes of these ice masses will make it possible to clarify how climate is changing in the Canadian Arctic and the potential impacts it may have on issues such as shipping accessibility, wildlife populations and native hunting practices. Dr. Copland recently published findings on glaciers and ice caps in the Yukon and Nunavut.

Finding Opportunities and Avoiding Loss

Climate change will affect infrastructure. The lifespan of building materials, heating and cooling demands, the integrity of roads and buildings, electricity infrastructure, and water and wastewater will be impacted in different ways. This means that the way infrastructure is designed must consider new weather conditions.

In Climate Ready, the government committed to developing infrastructure vulnerability assessment case studies to better understand where climate change could affect infrastructure throughout its lifecycle. As part of these case studies, Ontario worked with Engineers Canada to assess the vulnerability of three public buildings – a courthouse, a police headquarters and an office building. The vulnerability assessments are complete and the government is reviewing the recommendations on how to respond.

Other actions include:

- Providing funding to support the City of Welland's work with Niagara Region, Engineers Canada, Great Lakes and St. Lawrence Cities Initiative, and other partners to complete a climate change engineering risk assessment for wastewater, combined sewage and storm water infrastructure on a city-wide scale.
- Developing a guidance document on how to consider climate change in project design for any organization – such as municipal and provincial governments, public organizations, conservation authorities and Metrolinx – that needs to perform an environmental assessment.
- The Independent Electricity System Operator (IESO), Ontario Power Generation and Hydro One already incorporate risk evaluation and management as an ongoing part of their core business delivery, and use the best currently available information to project the potential effects of frequent and severe weather events.

Leadership: Institute for Catastrophic Loss Reduction

The Institute for Catastrophic Loss Reduction (ICLR) is the largest multi-disciplinary severe weather research organization in Canada. ICLR is the leader in the study of basement flooding risk reduction, and the design and construction of new homes resilient to damage from severe wind and other perils.

Based at Western University in London Ontario, more than $11 million in core funding for the Institute has been provided by Canada's insurance companies. The 30 senior scientists associated with ICLR have also secured more than $65 million from the Government of Canada, Government of Ontario and others that support academic research. ICLR workshops have shared emerging severe weather research findings with more than 4,000 individuals from the private and public sectors, including hosting the fourth UNESCO world conference on flood defence.

The Institute is working with municipalities, insurers and others to promote homeowner actions to reduce the risk of basement flooding. The Institute and its partners have built demonstration houses and retrofit homes across the country to showcase actions to reduce the risk of damage from severe weather. For example, in fall 2011, ICLR partnered with Habitat for Humanity in London to help build three demonstration homes featuring designs that highlighted energy efficiency and resilience to extreme weather. The homes featured backwater flow valves that would make the house less vulnerable to basement flooding as a result of intense rainstorms and augmented roofing construction, including hurricane straps, to increase the home's resilience to extreme winds and tornadoes. These homes are the most energy efficient homes ever built by Habitat London. They are also now the most disaster resilient because of the changes based on ICLR's climate impacts research.

Leadership: City of Guelph

The Smart Centres plaza at the intersection of Highway 6 and Highway 7 in Guelph features an innovative underground stormwater retention/detention system that has open bottoms and perforated sides to allow water infiltration.

The City of Guelph had concerns about a development of this size having negative impacts including increased stormwater runoff and decreased groundwater recharge. With expected increases in heavy rain events as a result of a changing climate, these stormwater issues would likely be worsened.

With the new system, water is collected from the parking lot through traditional catch basins, before passing through nine filters that remove oil, debris, silt, road salt and other substances. The water then enters the storage tanks and is slowly infiltrated back to the aquifer.

Studies have shown that the stormwater is returning to the aquifer at the same rate as before the plaza was built and not contributing water to the already overloaded stormwater management system – making the new system a huge success.

Preparing the Agricultural Sector

A thriving agricultural sector is integral to Ontario's economy. By being proactive, Ontario agricultural producers can enhance their competitiveness and economic resilience. The Province has been working with producers, veterinarians and academia to improve animal and plant health on farms. This includes identifying ways to prevent the spread of pathogens and enhanced monitoring and surveillance for early detection of a variety of animal diseases. We have also been working with partners to identify and monitor plant diseases and pests that could have an impact on the economic viability of the agricultural sector, including soybean rust, Brown Marmorated Stink Bug, Western Bean Cutworm and Spotted Wing Drosophila.

The need to address environmental challenges, including climate change, has been identified as one of the considerations in supporting the adaptability and sustainability of the agriculture and agri-food sectors. As part of this process, the Province is taking action including:

- Exploring the potential for new business risk management models to better reflect climate change stimuli, funding research that includes identifying risks and opportunities associated with a changing climate, and helping Ontario's agriculture sector best adapt to these anticipated changes.
- Working to enhance tools for farmers under the Environmental Farm Plan (EFP). An updated edition of the EFP workbook is now available and a number of the Best Management Practices handbooks will address issues related to climate change adaptation – specifically, water use efficiency, energy efficiency, nutrient use efficiency, soil conservation and others.
- Developing tools that will support farmers in integrating climate modelling information into water quality and quantity risk management planning for the purposes of source protection plan implementation.

CASE STUDY:

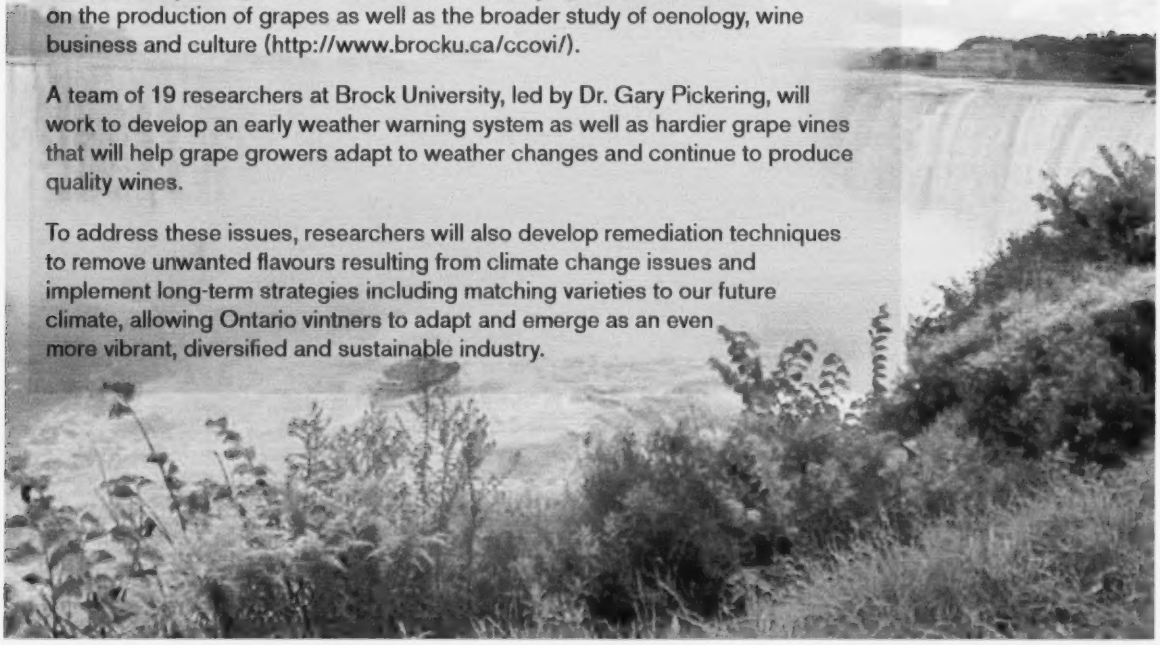
Groundbreaking Research to Support Ontario Grape Growers

Climate change will impact wine regions and the varieties we grow. In Ontario, the grape and wine industry contributes one billion dollars annually to the province's economy. Recognizing this, the Government of Ontario is investing $2.86 million from the Ontario Research Fund to protect Ontario's wine industry.

Brock University's Cool Climate Oenology and Viticulture Institute is an internationally recognized research institute studying the effects of climate on the production of grapes as well as the broader study of oenology, wine business and culture (http://www.brocku.ca/ccovi/).

A team of 19 researchers at Brock University, led by Dr. Gary Pickering, will work to develop an early weather warning system as well as hardier grape vines that will help grape growers adapt to weather changes and continue to produce quality wines.

To address these issues, researchers will also develop remediation techniques to remove unwanted flavours resulting from climate change issues and implement long-term strategies including matching varieties to our future climate, allowing Ontario vintners to adapt and emerge as an even more vibrant, diversified and sustainable industry.



Managing Risk to Ontario's Water Supply

The Government of Ontario is committed to protecting our vast water resources – from ensuring that our drinking water meets the highest standards for safety, to protecting the integrity of our shorelines and promoting coastal exploration and recreation.

Containing nearly 20 per cent of the Earth's fresh surface water, the Great Lakes are a global treasure. They provide us with drinking water, quality of life and prosperity. We need to keep the Great Lakes healthy now and for our children, grandchildren and future generations.

The Great Lakes-St. Lawrence Seaway System includes 90 commercial harbours and ports that conduct annual commerce exceeding 180 million metric tons. This integrated waterway system generates more than $4 billion and approximately 20,000 direct jobs in Canada and another $3 billion and 50,000 jobs in the U.S. More than 1 million recreational boaters also enjoy the waters of the Great Lakes.

Water levels are an important aspect of the Great Lakes for commercial and recreational navigation. Global warming is projected to mean a longer shipping and recreational boating season but lower water levels. A long-term decline in water levels would restrict access at docks, cottages and marinas, decrease the cargo capacity of ships, change some recreational boating routes and may cause water supply, taste and odour problems. If water levels are too low, cargo ships must reduce their loads. This reduced capacity increases the cost of transporting goods, estimated as approximately $800 in lost revenue per ship per one centimetre in lowered water levels.

The Great Lakes and St. Lawrence River Basin is home to over 98 per cent of Ontarians and it is where more than 80 per cent of Ontarians get their drinking water. Altogether, the Great Lakes and St. Lawrence River regional economy is considered the fourth largest in the world.

The Great Lakes are vulnerable to the changing climate. For example, more frequent severe storms may mean more erosion from the land and pollution of the lakes. In spring 2012, the Province released the draft Ontario's Great Lakes Strategy. This strategy could also help protect parts of the Great Lakes most at risk, contributing to their overall resilience and ability to change with the changing climate.

The draft Ontario's Great Lakes Strategy includes actions to understand and adapt to the impacts of climate change on the Great Lakes. This strategy includes:

- Building climate change into Great Lakes Agreements
- Considering local climate science information and then developing adaptive management actions

- Considering undertaking a pilot to assess the vulnerability of a water treatment plant to the impacts of climate change in partnership with the municipal and engineering sectors.

Increasing Ecosystem Resilience

To protect Ontario's flora and fauna, the government is developing a number of tools for natural resource managers and others involved in the protection and conservation of the environment.

We know the environmental conditions of ecosystems are continually evolving but we also know that the rate of climate change today may be exceeding their capacity to adapt successfully or quickly enough.

In December 2011, A Practitioners Guide to Climate Change Adaptation in Ontario's Ecosystems was released. The guide helps organizations like Conservation Authorities and stewardship groups prepare for climate change. We have also developed an online climate change adaptation toolbox, Cool Tools for a Hot Climate, designed to help specialists and other Ontarians learn about different techniques to assess climate vulnerability and take adaptation action.

From 2011- 2012, vulnerability assessments were conducted for selected natural resources in the Clay Belt of northeastern Ontario as part of a pilot study to help Ontarians develop adaptive solutions to a changing climate. A multi-step vulnerability assessment and adaptation framework was used to explore how natural resources may be affected by climate change. Stakeholders and partners, including several Aboriginal Communities, were engaged early

TAKING ACTION:

Encouraging Water Conservation

While we work to protect our water resources, using water more efficiently is an excellent way to adapt, because changing weather and precipitation trends can create additional strain on our water supplies. Reducing water wastage also reduces the amount of energy needed to pump, treat and heat water, thereby helping to mitigate climate change. Conserving and sustaining water resources presents an economic opportunity to foster innovative solutions and new technologies – which is the intent of Ontario's Water Opportunities Act.

The Province is committed to helping Ontario families conserve water and save money. In March 2012 , we announced the WaterSense® program, a voluntary water-efficiency labelling program. With the right information, consumers can conserve water by selecting and using more water efficient products such as faucets, showerheads and toilets. Products and services that have earned the WaterSense label have been certified to be at least 20 per cent more efficient without sacrificing performance.

TAKING ACTION:

50 Million Tree Program

Across southern Ontario, 11.3 million trees have been planted so far under the 50 Million Tree Program as a good step towards restoring the resilience of our ecosystems to climate change. Afforestation (planting trees at a large scale) addresses many of the other pressures facing our environment; conserving biodiversity, protecting habitat including that for species at risk, conserving soil, ground water and surface water, protecting against floods, improving air quality, sequestering carbon and engaging Ontarians directly to benefit our province for future generations.

in the process to identify potential adaptation options for natural, managed, and social systems in the Clay Belt.

Ontario is also developing a plan, Biodiversity: It's In Our Nature, to help achieve the goals and outcomes identified in Ontario's Biodiversity Strategy, 2011. An important action in the strategy is enhancing resilience of ecosystems by undertaking climate change vulnerability assessments and providing tools to support adaptation planning.

A changing climate will also mean there will be new opportunities for invasive species to establish themselves in new locales, presenting a threat to biodiversity by damaging or displacing native species and ecosystems. Since 2011, the Province has been leading the development of an Ontario Invasive Species Strategic Plan. The draft plan was posted for public comment on the Environmental Registry, and workshops were held with experts and conservation professionals to provide input to the plan. The final version is available for viewing on the Environmental Registry: http://www.ebr.gov.on.ca.

Research and monitoring are also being done on Ontario's forests, fisheries and wildlife to assist us in altering our policies and resource management decisions to accommodate changing species, ranges and behaviour of species and populations.

SECTION 7: LOOKING AHEAD

Continuing to Build on World-Leading Adaptation Strategies

Our adaptation actions are win-win. They provide benefits while meeting other social, environmental or economic objectives.

In addition to the plans and strategies already discussed, a number of forward looking actions are in development:

- Working with the federal government in negotiations of a new Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA) to consider climate change impacts and adaptation measures.
- Considering public comments on the implementation plan for Ontario's Biodiversity Strategy.
- Finalizing the climate change adaptation strategy for the Lake Simcoe area. In 2011, in response to the Lake Simcoe Protection Plan, the Ministry of the Environment led a climate change vulnerability assessment for the Lake Simcoe Watershed to inform development of a climate change adaptation strategy. This project involved scientists and practitioners working in government and universities, First Nations and Métis communities, and the general public.
- Continuing our support for better science on the impacts of climate change through initiatives related to climate modelling and monitoring of our ecosystems.
- Working to refine tools and resources that communities need for adaptation planning such as risk assessment and adaptation strategy development processes.
- Participating in the new Natural Resources Canada Adaptation Platform to connect with and support priority sectors in Ontario through targeted and strategic activities.

Since releasing our first adaptation strategy and action plan, Climate Ready: Ontario's Adaptation Strategy and Action Plan 2011-2014, our government has been connecting and collaborating with universities, municipalities and various communities to develop and implement policies and tools to help Ontario prepare for, and respond to, the impacts of a changing climate.

Through leadership and collective action, Ontario is employing adaptation strategies to protect our ecosystems, our infrastructure and personal property, our agricultural communities, our drinking water and our health.

We are assessing how vulnerable forests, fisheries and wildlife are to climate change and finding ways to conserve biodiversity and protect the nearly 200 Ontario native species at risk.

In addition, we are ensuring our critical infrastructure – including healthcare, electrical and telecommunications infrastructure – function effectively during a major weather event.

To protect the agricultural community, we are working with partners to monitor and identify plant diseases and enhancing the early detection monitoring of animals to identify ways to prevent the spread of diseases. Through these measures, along with research and implementation of management strategies, we are helping Ontario farmers reduce risk and strengthen their economic stability.

We are developing new systems to provide flood warnings and ensuring the impacts of climate change are considered in Ontario's drinking water safety net and source protection planning under the Clean Water Act and the draft Lake Simcoe Adaptation Strategy.

We are conducting active surveillance of mosquito and tick populations to track the spread of vector-borne diseases such as Lyme Disease and West Nile Virus. Under the Health Protection and Promotion Act, the Ontario Public Health Standard for prevention and management of environmental hazards specifically requires increased promotion of public awareness of the health hazards associated with climate change.

To reduce the impact of climate change on human health, we are also investigating the use of local adaptation frameworks that focus on linkages between human health and the environment.

Ontarians are benefiting from our adaptation strategies and our mitigation efforts. Lower greenhouse gas emissions and compact, sustainable communities with appropriate transit options are key to our long term strategy for the province. Addressing climate change now will improve our economy and quality of life in the short term and for future generations.

For detailed appendices of Ontario's adaptation initiatives and GHG emissions data, please download the PDF from our website:

For the English report:
http://www.ene.gov.on.ca/environment/en/resources/STDPROD_100825

For the French report:
http://www.ene.gov.on.ca/environment/fr/resources/STDPROD_100827

CONCLUSION

According to the International Energy Agency (IEA), for every year that passes, the cost of transforming the global energy sector to address climate change increases by about $500 billion. We are taking action now to lessen the social and economic cost that will occur if we take a wait-and-see approach to reducing our greenhouse gas emissions or delay preparing for the impacts of climate change.

The fight against climate change is already playing a large role in the global economy, and will play an even bigger part in the future. In fact, directly or indirectly, our economy depends on the environment, and we can't afford to be left behind. This is why our province continues to invest in clean technologies, helping industries to be innovative while reducing their emissions and taking action to safeguard our communities against the impacts of climate change.

Many of these actions will reduce greenhouse gas emissions, minimize losses due to extreme weather and provide an immediate and long-term boost to Ontario's economy. Our mitigation and adaptation strategies are yielding results and we expect to achieve even more as new plans and programs are put in place.

Climate change is a global issue and requires local, national and international collaboration and cooperation. Sustainable communities and a low-carbon economy are necessary adjustments we need to make in order to ensure a future where all Ontarians can continue to enjoy the benefits of our great province.

For more
information on
climate change,
visit the Ministry of
the Environment at:
Ontario.ca/environment
or call
1-800-565-4923

Ontario